

Spring 2021 Lab 1 Main Project

Description: Design, build, and document the development of an autonomous robot capable of navigating a metallic tape racing track.

Initial Parameters: The racing track will be emulated using metallic tape placed on the ground. The track will contain at least one corner ramp, and one alternative path. The robot will be required to navigate the track twice through. During navigation through the alternative path, the robot's speed must be reduced compared with its normal speed on the track. The robot actions will be determined through color detection of three colors: red, green, and blue. Red will indicate a 'stop' condition, green a 'go' condition, and blue a 'caution' condition. Go and stop conditions will be placed at the starting line, and the caution speed indication will be located on/at the alternative path. The alternative path must be navigated in the case the main pathway is blocked. Initially, the robot will be placed into a stop condition waiting for the go condition to arise. The track setup is illustrated in Figure 1.

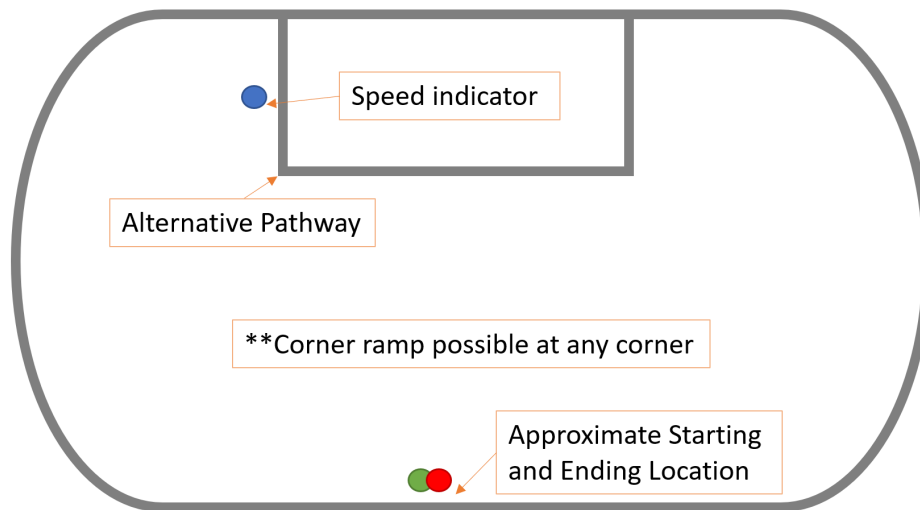


Figure 1: Track Illustration

Technical Functionality: The robot should be capable of the following technical functionality: color detection, metallic tape track detection, obstacle avoidance, and speed control.

Color Detection: Detect the condition on the track: go, stop, and caution.

Metallic Tape Track Detection: Detect and navigate the metallic tape track (1.25 to 1.5 inch wide).

Obstacle Avoidance: The robot should be capable of avoiding an obstacle on the track.

Speed Control: While navigating the alternative pathway, speed must be reduced.

Expectation: A fully functional robot would be capable of navigating the track, avoiding track obstacles, and detecting the appropriate operating conditions based on color detection.